Contribution ID: **41** Type: **Poster Presentation**

Effect of Deposition Temperature on the Structural, Morphological and Electrochemical Properties of LiFePO4 Thin films Nanomaterials Prepared by Chemical Bath Deposition.

Tuesday, 4 July 2017 17:10 (1h 50m)

The advantages of LiFePO4 nanomaterials for use as positive electrode in lithium ion batteries are their excellent cycle life, structural stability, cost effectiveness and environmental friendliness. Their main limitation however is the low electrical conductivity which can be overcome by synthesizing particles at the nanoscale with homogenous size distribution. This work employs a simple and cost effective method to produce homogenous nanoparticles of lithium iron Phosphate (LiFePO4). The nanoparticles were deposited on Fluorine doped Tin Oxide (FTO) glass substrates at temperatures of 25, 60, 70, 80, 90, and 100 oC using chemical bath deposition (CBD) method. The surface structure, morphology and electrochemical analyses were carried out on the deposited films, studied and reported. The morphology of the deposited films was studied using scanning electron microscopy (SEM) and the films exhibited homogeneous average crystal sizes. X-ray diffractometry (XRD) studies revealed highly polycrystalized structures, which increased with deposition temperature. The crystal grain sizes were calculated from the XRD results using Crystallite Size and D.K. Shukla Crystal Size Calculation software. The average crystal sizes of the deposited films were found increasing from 121-153nm with increased deposition temperature. The charge-discharge test was carried out using cyclic voltammetry and it showed an increased specific charge capacity up to 153mAhg-1 with increased temperature of deposition. The work concluded that deposition temperature has great influence on the morphology and electrochemical properties of the thin films.

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Session Classification: Poster Session 1

Track Classification: Track A - Division for Physics of Condensed Matter and Materials